

FORM PTO-1390
(REV 11-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

P150299

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

09/423414

INTERNATIONAL APPLICATION NO.
PCT/CA98/00463INTERNATIONAL FILING DATE
06 May 1998PRIORITY DATE CLAIMED
07 May 1997

TITLE OF INVENTION TELECONFERNCING ROBOT WITH SWIPELING VIDEO MONITOR

APPLICANT(S) FOR DO/EO/US

SMITH, Graham Thomas, FELS, Deborah Ingrid and TREVIRANUS, Jutta

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (**unsigned**)
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:
 - (a) Verified Statement - Independent Inventor (unsigned)
 - (b) Verified Statement - Small Business Concern - Telbotics Inc. (unsigned)
 - (c) Verified Statement - Non-profit Organization - Ryerson Polytechnic University (copy)
 - (d) Verified Statement - Non-profit Organization - The University of Toronto (copy)
 - (e) Form PCT/IB/308.

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)

09/423414

INTERNATIONAL APPLICATION NO.
PCT/CA98/00463ATTORNEY'S DOCKET NUMBER
P15029917. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :**

Neither international preliminary examination fee (37 CFR 1.482)
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO
and International Search Report not prepared by the EPO or JPO \$970.00

International preliminary examination fee (37 CFR 1.482) not paid to
USPTO but International Search Report prepared by the EPO or JPO. \$840.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but
international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$760.00

International preliminary examination fee paid to USPTO (37 CFR 1.482)
but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$670.00

International preliminary examination fee paid to USPTO (37 CFR 1.482)
and all claims satisfied provisions of PCT Article 33(1)-(4) \$96.00

ENTER APPROPRIATE BASIC FEE AMOUNT =**CALCULATIONS PTO USE ONLY**

\$ 840.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	20 - 20 =	NIL	X \$18.00
Independent claims	1 - 3 =	NIL	X \$78.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable) NIL			+ \$260.00

\$

\$

\$

TOTAL OF ABOVE CALCULATIONS =

\$ 840.00

Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement
must also be filed (Note 37 CFR 1.9, 1.27, 1.28).

\$ 420.00

SUBTOTAL =

\$ 420.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(f)).

\$

+

TOTAL NATIONAL FEE =

\$ 420.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property

+

\$ 40.00

TOTAL FEES ENCLOSED =

\$ 460.00

Amount to be:
refunded
charged

\$

\$

a. ☒ A check in the amount of \$ 460.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.

c. ☐ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any
overpayment to Deposit Account No. 18-1350. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO.

SIGNATURE

NAME JEFF PERVANAS41, 543

REGISTRATION NUMBER

Applicant or Patentee: SMITH, Graham Thomas, FELS, Deborah Ingrid and TREVIRANUS, Jutta
Serial or Patent No.: 35 U.S.C. 371 of PCT Application Serial No. PCT/CA98/00463 (now USSN 09/423,414)
Filed or Issued: 05/06/98 (6 May 1998) Atty. Dkt. No.: P150299
For: "Teleconferencing Robot With Swiveling Video Monitor"

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR**

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for the purposes of paying reduced fees under section 41(a) and(b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled "Teleconferencing Robot With Swiveling Video Monitor" described in

- () the specification filed herewith
(X) application serial no. PCT/CA98/00463, filed 6 May 1998
() patent no. _____, issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concerned or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- () no such person, concern or organization
(X) persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

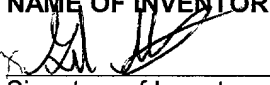
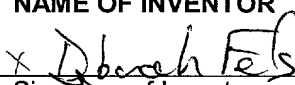
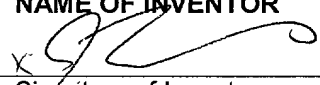
FULL NAME TELBOTICS INC.
ADDRESS 46 Sherbourne Street, Toronto, Ontario, Canada, M5A 2P7
() INDIVIDUAL (X) SMALL BUSINESS CONCERN () NON-PROFIT ORGANIZATION

FULL NAME RYERSON POLYTECHNIC UNIVERSITY
ADDRESS 350 Victoria Street, Toronto, Ontario, Canada, M5B 2K3
() INDIVIDUAL () SMALL BUSINESS CONCERN (X) NON-PROFIT ORGANIZATION

FULL NAME THE UNIVERSITY OF TORONTO
ADDRESS 27 King's College Circle, Toronto, Ontario, M5S 1A1
() INDIVIDUAL () SMALL BUSINESS CONCERN (X) NON-PROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Graham Thomas SMITH	Deborah Ingrid FELS	Jutta TREVIRANUS
NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
		
Signature of Inventor	Signature of Inventor	Signature of Inventor
Date <u>Nov 25, 99</u>	Date <u>Nov. 25/99</u>	Date <u>Nov 25/99</u>
11/22/99		

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(c))--SMALL BUSINESS CONCERN**

Docket Number (Optional)
P150299

Applicant, Patentee, or Identifier: **SMITH, Graham Thomas**
Application or Patent No.: **35 USC 371 of PCT Application No. PCT/CA98/00463**
Filed or Issued: **05/06/98 (6 May 1998)** (**now USN 09/423,414**)
Title: **Teleconferencing Robot With Swiveling Video Monitor**

I hereby state that I am

- ☒ the owner of the small business concern identified below:
☐ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN **Telbotics Inc.**

ADDRESS OF SMALL BUSINESS CONCERN **46 Sherbourne Street
Toronto, Ontario, CANADA, M5A 2P7**

I hereby state that the above identified small business concern qualifies as a small business concern as defined in 13 CFR Part 121 for purposes of paying reduced fees to the United States Patent and Trademark Office. Questions related to size standards for a small business concern may be directed to: Small Business Administration, Size Standards Staff, 409 Third Street, SW, Washington, DC 20416.

I hereby state that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

- ☐ the specification filed herewith with title as listed above.
☒ the application identified above.
☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention must file separate statements as to their status as small entities, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization having any rights in the invention is listed below:
☐ no such person, concern, or organization exists.
☒ each such person, concern, or organization is listed below
RYERSON POLYTECHNIC UNIVERSITY, THE UNIVERSITY OF TORONTO
Separate statements are required from each named person, concern or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

NAME OF PERSON SIGNING **Graham Thomas SMITH**

TITLE OF PERSON IF OTHER THAN OWNER **President**

ADDRESS OF PERSON SIGNING **61 Euclid Ave., Apt.2, Toronto, ON, CA M6J 2J8**

SIGNATURE **X [Signature]** DATE **Mar 28/99**

**STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(d))—NONPROFIT ORGANIZATION**

Docket Number (Optional)
F150295

Applicant, Patentee, or Identifier: SMITH, Graham Thomas, FELS, Deborah Ingrid & TREVIRANUS, Jutta
Application or Patent No.: A filing under 35 USC 371 from PCT Int'l Appl'n PCT/CA98/00463
Filed or issued: 05/06/98 (6 May 1998) (now USPN 09/423,414)
Title: "Teleconferencing Robot With Swiveling Video Monitor"

I hereby state that I am an official empowered to act on behalf of the nonprofit organization identified below:

NAME OF NONPROFIT ORGANIZATION RYERSON POLYTECHNIC UNIVERSITY
ADDRESS OF NONPROFIT ORGANIZATION 350 Victoria Street
Toronto, Ontario, Canada, M5B 2K3

TYPE OF NONPROFIT ORGANIZATION:

- ☒ UNIVERSITY OR OTHER INSTITUTION OF HIGHER EDUCATION
- ☐ TAX EXEMPT UNDER INTERNAL REVENUE SERVICE CODE (26 U.S.C. 501(a) and 501(c)(3))
- ☐ NONPROFIT SCIENTIFIC OR EDUCATIONAL UNDER STATUTE OF STATE OF THE UNITED STATES OF AMERICA
(NAME OF STATE _____)
(CITATION OF STATUTE _____)
- ☐ WOULD QUALIFY AS TAX EXEMPT UNDER INTERNAL REVENUE SERVICE CODE (26 U.S.C. 501(a) and 501(c)(3))
IF LOCATED IN THE UNITED STATES OF AMERICA
- ☐ WOULD QUALIFY AS NONPROFIT SCIENTIFIC OR EDUCATIONAL UNDER STATUTE OF STATE OF THE UNITED
STATES OF AMERICA IF LOCATED IN THE UNITED STATES OF AMERICA
(NAME OF STATE _____)
(CITATION OF STATUTE _____)

I hereby state that the nonprofit organization identified above qualifies as a nonprofit organization as defined in 37 CFR 1.9(e) for purposes of paying reduced fees to the United States Patent and Trademark Office regarding the invention described in:

- ☐ the specification filed herewith with title as listed above.
☒ the application identified above.
☐ the patent identified above.

I hereby state that rights under contract or law have been conveyed to and remain with the nonprofit organization regarding the above identified invention. If the rights held by the nonprofit organization are not exclusive, each individual, concern, or organization having rights in the invention must file separate statements as to their status as small entities and that no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization having any rights in the invention is listed below:

- ☐ no such person, concern, or organization exists.
☒ each such person, concern, or organization is listed below.

TELBOTICS INC., THE UNIVERSITY OF TORONTO

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NAME OF PERSON SIGNING Michael Owen

TITLE IN ORGANIZATION OF PERSON SIGNING Director, Research Services

ADDRESS OF PERSON SIGNING c/o Ryerson Polytechnic University

SIGNATURE X Michael Owen DATE November 2, 1999

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(d))--NONPROFIT ORGANIZATION

Docket Number (Optional)
P150299

Applicant, Patentee, or Identifier: SMITH, Graham Thomas, FELS, Deborah Ingrid & TREVIRANUS, Jutta

Application or Patent No.: A filing under 35 USC 371 from PCT Int'l Appl'n PCT/CA98/00463

Filed or Issued: 05/06/98 (6 May 1998) (now USPN 09/423,414)

Title: "Teleconferencing Robot With Swiveling Video Monitor"

I hereby state that I am an official empowered to act on behalf of the nonprofit organization identified below:

NAME OF NONPROFIT ORGANIZATION THE UNIVERSITY OF TORONTO

ADDRESS OF NONPROFIT ORGANIZATION 27 King's College Circle
Toronto, Ontario, Canada, M5S 1A1

TYPE OF NONPROFIT ORGANIZATION:

☒ UNIVERSITY OR OTHER INSTITUTION OF HIGHER EDUCATION

☐ TAX EXEMPT UNDER INTERNAL REVENUE SERVICE CODE (26 U.S.C. 501(a) and 501(c)(3))

☐ NONPROFIT SCIENTIFIC OR EDUCATIONAL UNDER STATUTE OF STATE OF THE UNITED STATES OF AMERICA
(NAME OF STATE _____)
(CITATION OF STATUTE _____)

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IF LOCATED IN THE UNITED STATES OF AMERICA

☐ WOULD QUALIFY AS NONPROFIT SCIENTIFIC OR EDUCATIONAL UNDER STATUTE OF STATE OF THE UNITED
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(NAME OF STATE _____)
(CITATION OF STATUTE _____)

I hereby state that the nonprofit organization identified above qualifies as a nonprofit organization as defined in 37 CFR 1.9(e) for purposes of paying reduced fees to the United States Patent and Trademark Office regarding the invention described in:

- ☐ the specification filed herewith with title as listed above.
☒ the application identified above.
☐ the patent identified above.

I hereby state that rights under contract or law have been conveyed to and remain with the nonprofit organization regarding the above identified invention. If the rights held by the nonprofit organization are not exclusive, each individual, concern, or organization having rights in the invention must file separate statements as to their status as small entities and that no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization having any rights in the invention is listed below:

- ☐ no such person, concern, or organization exists.
☒ each such person, concern, or organization is listed below.

TELBOTICS INC., RYERSON POLYTECHNIC UNIVERSITY

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NAME OF PERSON SIGNING Peter Munsche

TITLE IN ORGANIZATION OF PERSON SIGNING Ass't Vice-President, Technology Transfer

ADDRESS OF PERSON SIGNING c/o The University of Toronto

SIGNATURE X [Signature] DATE November 5, 1999

STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(d))—NONPROFIT ORGANIZATION

Docket Number (Optional)
F150295

Applicant, Patentee, or Identifier: SMITH, Graham Thomas, FELS, Deborah Ingrid & TREVIRANUS, Jutta
Application or Patent No.: A filing under 35 USC 371 from PCT Int'l Appl'n PCT/CA98/00463
Filed or Issued: 05/06/98 (6 May 1998)
Title: "Teleconferencing Robot With Swiveling Video Monitor"

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NAME OF NONPROFIT ORGANIZATION RYERSON POLYTECHNIC UNIVERSITY
ADDRESS OF NONPROFIT ORGANIZATION 350 Victoria Street
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- ☐ TAX EXEMPT UNDER INTERNAL REVENUE SERVICE CODE (26 U.S.C. 501(a) and 501(c)(3))
- ☐ NONPROFIT SCIENTIFIC OR EDUCATIONAL UNDER STATUTE OF STATE OF THE UNITED STATES OF AMERICA
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IF LOCATED IN THE UNITED STATES OF AMERICA
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(NAME OF STATE _____)
(CITATION OF STATUTE _____)

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- ☒ the application identified above.
- ☐ the patent identified above.

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- ☒ each such person, concern, or organization is listed below.

TELBOTICS INC., THE UNIVERSITY OF TORONTO

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NAME OF PERSON SIGNING Michael Owen

TITLE IN ORGANIZATION OF PERSON SIGNING Director, Research Services

ADDRESS OF PERSON SIGNING c/o Ryerson Polytechnic University

SIGNATURE X Michael Owen DATE November 2, 1999

09/423414

420 Rec'd PCT/PTO 08 NOV 1999

In re application of:

SMITH, Graham Thomas et al.

Serial No.: Unknown
(corresponding to International Application No. PCT/CA98/00463)

International Filing Date: 6 May 1998

Re: TELECONFERENCING ROBOT WITH SWIVELING VIDEO MONITOR

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C.

Dear Sir:

Prior to examination of the claims of the above identified patent application, the applicant respectfully requests that the application be amended as follows:

IN THE DISCLOSURE

At page 1, line 2, please amend the disclosure as follows:

Please insert the following paragraph:

-- The applicant claims the benefit of 35 U.S.C. §119(e) of the United States Provisional Application No. 60/045,793 filed 7 May 1997. --

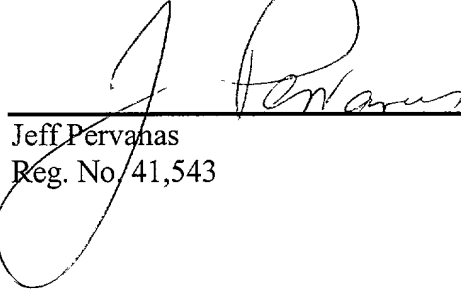
REMARKS

In this amendment, the applicant amends disclosure page 1 to include reference to the United States Provisional Application No. 60/045,793 which forms the priority basis for corresponding International Application No. PCT/CA98/00463.

In the event that this paper is not timely filed, the applicant hereby petitions for an appropriate extension of time. The fee for this extension may be charged to our Deposit Account No. 18-1350, along with any other additional fees which may be required with respect to this paper.

Respectfully submitted,

RICHEs, McKENZIE & HERBERT



Jeff Pervanas
Reg. No. 41,543

JP/caf
Encls.
Ret.Ack.Card

November 5, 1999

09/423414

Rec'd PCT/PTO 08 NOV 1999

In re application of:

SMITH, Graham Thomas et al.

Serial No.: Unknown
(corresponding to International Application No. PCT/CA98/00463)

International Filing Date: 6 May 1998

Re: TELECONFERENCING ROBOT WITH SWIVELING VIDEO MONITOR

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C.

Dear Sir:

Prior to examination of the claims of the above identified patent application, the applicant respectfully requests that the application be amended as follows:

IN THE DISCLOSURE

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-- The applicant claims the benefit of 35 U.S.C. §119(e) of the United States Provisional Application No. 60/045,793 filed 7 May 1997. --

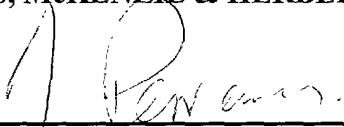
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Respectfully submitted,

RICHER, McKENZIE & HERBERT



Jeff Pervanas
Reg. No. 41,543

JP/caf
Encls.
Ret.Ack.Card

November 5, 1999

5 Title: Teleconferencing Robot with Swiveling Video Monitor

FIELD OF THE INVENTION

10 This invention relates to an apparatus for enabling a remote
conferee to project his or her presence into a group meeting
environment using a combination of videoconferencing/
teleconferencing technology and robotics technology. Combining
videoconferencing/teleconferencing elements with robotics elements
helps create a sense that the remote conferee has a physical presence in
the room which allows for more direct personal interaction in group
15 meeting environments and social situations.

BACKGROUND OF THE INVENTION

20 Videoconferencing/teleconferencing is an effective form of
communication which allows distant conferees the ability to see and hear
each other over long distances. Unfortunately this technology is not
being utilized as effectively as it could be due to the inherent nature of
how people view television. When people view television they tend to
sit passively and absorb information. This passive viewing behaviour is
counter-productive when people utilize videoconferencing/
25 teleconferencing where direct two-way non-passive interaction is
required. Currently available videoconferencing/teleconferencing
systems suffer from this drawback.

30 In conventional teleconferencing systems, it often appears
as if the remote conferee is avoiding the viewer's eyes since the video
camera capturing the image of the remote conferee is typically positioned
above, below, or to one side of the video monitor which the remote
conferee is viewing. There are proposals intended to enable a remote
conferee to facilitate direct eye contact with the local conferees as
described, for example, in U.S. Pat. No. 4,928,301, issued May 22, 1990; U.S.

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Pat. No. 5,117,285, issued May 26, 1992; U.S. Pat. No. 5,359,362, issued Oct. 25, 1994; and U.S. Patent No. 5,400,069, issued Mar. 21, 1995. These proposals are intended to make the remote conferee appear as if he or she is gazing directly into the eyes of the viewer. This apparent direct eye
5 contact can further add to the sense of personal contact and reinforce the remote conferee's sense of presence in the group meeting space. Many of these proposals are complex and to the applicant's knowledge they have not enjoyed significant success in the marketplace. Additionally, the remote conferee's image, and the video camera which provide an image
10 to the remote conferee are both essentially stationary, limiting the effective field of view for the remote conferee and his or her sense of participation in a conference.

SUMMARY OF THE INVENTION

15 To transform the television into a more dynamic, interactive device a substantially life-sized image of a remote conferee's face is displayed on a television or video monitor and the television or video monitor is controlled to swivel left or right to create the impression that the remote conferee is turning his or her head to look at
20 a person speaking. The swiveling video monitor may also be lifted up or lowered down to an appropriate height by a vertical lifting and lowering mechanism to mimic a standing or sitting position or achieve some height in between. The swiveling video monitor and the vertical lifting and lowering mechanism can further be coupled to a mobile ground unit
25 to allow the remote conferee to move around the room in which the group meeting is taking place. The video monitor together with the vertical lifting and lowering mechanism may also mimic a bowing motion to be used as a form of greeting when appropriate. An attention-getting mechanism may also be incorporated so that the remote conferee
30 may politely interrupt a conversation. For example, a mechanical representation of a raised and waving hand may be used for such a purpose. These physical movements shatter the mental construct that

people have for what television is and allows them to think of television in a new way: the television is no longer simply a passive object but rather assumes a robotic presence, in essence becoming a part of what may be called a teleconferencing robot.

5 As already stated, preferably, the image of the remote conferee's face on the video monitor is substantially life-size. This gives people interacting with the teleconferencing robot a frame of reference that is based on conventional human dynamics (i.e. the size of the head) as opposed to a conventional teleconference where the head could appear
10 either very small or large. The remote conferee can remotely control the teleconferencing robot to look left or right. Optionally, a sound location system built into the teleconferencing robot can be used to determine where the speaking person is positioned relative to the teleconferencing robot, and can be used to generate a control signal to automatically swivel the video
15 monitor head left or right so that the remote conferee appears to be turning to look at the person speaking. This allows the remote conferee to concentrate on the social interaction, rather than on controlling the movement of the teleconferencing robot.

 In accordance with the present invention, there is provided a
20 teleconferencing robot, for enabling a remote conferee to project a sense of presence into a group meeting, the teleconferencing robot comprising: a base; a video monitor movably mounted to the base for receiving and displaying an image of the remote conferee; a video camera movably mounted on the base; control means mounted on the base for moving the
25 video monitor and video camera in response to an input control signal; and wherein said video monitor and video camera move in response to said input control signal to enable a remote conferee to project a sense of presence into the group meeting.

In accordance with another aspect, the present invention provides a teleconferencing robot in combination with a remote teleconferencing unit which comprises a second microphone and a second
5 video camera for obtaining an audio signal and an image from the remote conferee for transmission to the video monitor of the teleconferencing robot, and a

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second video monitor and a second speaker for providing an image and an audio signal received from the teleconferencing robot, wherein the video monitor of the teleconferencing robot is provided with a speaker for outputting an audio signal received from the microphone of the remote teleconferencing unit; and wherein the input control signal is provided by the remote teleconferencing unit.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, which show a preferred embodiment of the present invention and in which:

FIG. 1 is a perspective view of the teleconferencing robot on a rolling stand;

FIGS. 2a-2c are perspective views of the teleconferencing robot's swiveling feature in operation;

FIG. 3 is a side view of the teleconferencing robot with a cut-out view of the swivel base;

FIGS. 4a-4c are perspective views of the teleconferencing robot in various desk storage arrangements;

FIG. 5 is a simplified side cross-sectional view of the teleconferencing robot with vertical lifting and lowering mechanism and remote-controllable mobile ground unit;

FIGS. 6a-6c are perspective views of the teleconferencing robot and mobile ground unit of FIG. 5 in operation;

FIGS. 7a-7c are perspective views of the vertical lifting and lowering mechanism of figure 5 in operation;

FIG. 8a-8d are perspective views of the attention-getting mechanism in operation;

FIG. 9 is a schematic block diagram showing the link between the remote teleconferencing unit at the remote conferee's site and the teleconferencing robot at the local group meeting site;

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FIG. 10 is a schematic block diagram of the remote teleconferencing unit at the remote conferee's site;

FIG. 11 is a schematic block diagram of the teleconferencing robot at the local group meeting site;

5 FIG. 11a is a perspective view of one embodiment of a position sensor shown in FIG. 11;

FIG. 11b is a side view of another embodiment of a position sensor shown in FIG. 11;

FIG. 12 is a schematic block diagram of the vertical lifting
10 and lowering mechanism;

FIG. 13 is a schematic block diagram of the mobile ground unit; and

FIGS. 14a-14c are perspective views of an alternative design of the teleconferencing robot.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment of the invention will now be described with reference to the figures.

FIG. 1 shows a perspective view of a teleconferencing robot
20 100 placed on a rolling stand 10. The teleconferencing robot 100 has a swivel base 20 having a lower stage 22 secured to the stand and rotating upper stage 24 rotatable about a vertical axis with respect to lower stage 22. The rotating upper stage 24 has a defined forward direction. In the preferred embodiment of the invention, the top-front portion of rotating
25 upper stage 24 is rounded and forwardly sloped to prevent loose items from being placed there. A video monitor 40 is placed on or fastened to the top-rear portion of the rotating upper stage 24. A supporting arm 12 extends from the lower stage 22 and supports a platform 16 positioned just above the video monitor 40. The platform 16 supports a speaker
30 location system 60. One such system is commercially available from PictureTel Corporation of Andover, MA, USA. The speaker location system includes a video camera 50 with a pan/tilt video camera base 52.

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Microphones 62a, 62b and 62c pick up the sound coming from the person speaking and generate an appropriate control signal to control the pan/tilt video camera base 52 and the zoom on the video camera 50 so that the video camera 50 is directed at the person speaking. These functions are described in greater detail below with reference to FIGS. 9-11.

Now referring to FIGS. 2a-2c, the swiveling feature of the teleconferencing robot 100 is shown in a series of three perspective views. In the first view, FIG. 2a, the teleconferencing robot 100 is shown in a default starting position with video monitor 40, video camera 50 and microphones 62a, 62b and 62c substantially directed in the same forward direction as that defined by the forward direction of rotating upper stage 24 of swivel base 20. In FIG. 2b, in response to a control signal, the rotating upper stage 24 of the swivel base 20, the video monitor 40 and the video camera 50 have turned partially towards the viewer/speaker (viewer/speaker not shown but assumed to be in the same viewing position for all of FIGS. 2a-2c). This function will be explained later in greater detail with reference to FIGS. 9-13. In FIG. 2c, the rotating upper stage 24, video monitor 40, and video camera 50 have turned fully towards the viewer/speaker. During this turning operation, the rotating upper stage 24, video monitor 40, and video camera 50 are substantially synchronized to each other. The rolling stand 10, the supporting arm 12, the lower stage 22 of the swivel base 20, platform 16 and microphones 62a, 62b and 62c remain fixed in position during the swiveling operation illustrated in FIGS. 2a-2c.

FIG. 3 shows a side view of the teleconferencing robot 100 with a simplified cut-out view of swivel base 20. The rotating upper stage 24 and lower stage 22 are connected by a swiveling mechanism 25. Alternative coupling arrangements between the rotating upper stage 24 and lower stage 22 are possible. However, regardless of the coupling arrangement, a swivel point 21 is formed. The rotating upper stage 24 rotates about a vertical axis passing through the swivel point 21. The

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rotating upper stage 24 is engaged to a rotating upper stage drive unit 30, such as a servo-motor, which can swivel the rotating upper stage 24 about the vertical axis passing through the swivel point 21. A micro-controller 28 controls the rotating upper stage drive unit 30. A detailed
5 description of this function is provided later with reference to FIGS. 9-11.

Still referring to FIG. 3, the screen of video monitor 40 is placed at or near the vertical axis passing through the swivel point 21 so that the screen of video monitor 40 may be viewed from a wider angle. If the screen of video monitor 40 is positioned too far forward, then the
10 viewing angle will be significantly reduced for those conferees who are sitting to either side and close to the video monitor 40. In the present invention, the placement of the screen of video monitor 40 is such that two straight lines lying in a horizontal plane and crossing at the vertical axis passing through the swivel point 21, and touching the left and right
15 edges of the screen of video monitor 40, respectively, form an angle of 160° to 200°.

FIGS. 4a-4c show some desk storage arrangements for the teleconferencing robot 100 with a desk shown at 170. FIG. 4a shows one possible storage arrangement for the teleconferencing robot 100 where
20 the teleconferencing robot is positioned under the desk 170. The desk is then provided with a removable panel to enable the robot 100 to be raised, in a manner described below, to a position flush with the top of the desk 170. FIG. 4b shows the teleconferencing robot 100 mounted in an operating position, on the desktop. FIG. 4c shows an alternative
25 storage arrangement where the supporting arm 12 supports a removable desktop panel 18. A vertical lifting and lowering mechanism 70 raises the teleconferencing robot 100 raises into an operating position, level with the desktop, and simultaneously displaces the panel 18 vertically upwards.

30 FIG. 5 shows a simplified side cross-sectional view of a further embodiment of the teleconferencing robot 100 provided with the vertical lifting and lowering mechanism 70 and a mobile ground unit 80.

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The vertical lifting and lowering mechanism 70 comprises piston assemblies 71a, 71b and 71c which may be extended and retracted in concert to raise and lower the teleconferencing robot 100. The piston assemblies 71a, 71c are parallel and spaced apart, so that the three piston
5 assemblies provide three point support. Piston assembly drive units 74a, 74b and 74c are operationally engaged to piston assemblies 71a, 71b and 71c, respectively. Vertical lifting and lowering control unit 73 controls the piston drive units 74a, 74b and 74c. The piston assemblies 71a, 71b and 71c are protected and hidden by a flexible accordion sleeve 72. A
10 more detailed description of the operation of the vertical lifting and lowering mechanism is provided later, with particular reference to FIG. 12.

Still referring to FIG. 5, the mobile ground unit 80 houses a power source 87, drive motors 81a and 81b engaged to drive wheels 82
15 and 83, respectively, and a mobile ground unit control 88 to control the direction and speed of drive motors 81a and 81b. The mobile ground unit 80 is remotely controllable by using a remote control unit 89. Typically, instructions transmitted by a radio signal from the remote control unit 89 are received by an antenna 86 and relayed down to the
20 mobile ground control unit 88. However, many other communication means are possible. A more detailed description of the operation of the mobile ground unit 80 is provided later with particular reference to FIG. 13.

FIGS. 6a-6c show the teleconferencing robot 100 and mobile
25 ground unit 80 in operation. FIG. 6a shows the teleconferencing robot 100 and the mobile ground unit 80 in a default starting position, with rotating upper stage 24, lower stage 22, video monitor 40 and dynamic speaker locating system 60 all oriented in a defined forward direction. The forward path of mobile ground unit 80 (i.e. the direction of travel if
30 both drive wheels 82 and 83 are engaged in the same direction at the same speed) is also oriented in the same defined forward direction. FIG. 6b shows the teleconferencing robot with the rotating upper stage 24.

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video monitor 40 and video camera 50 all rotated to face the viewer. When the remote conferee wishes to approach the viewer, in order to maintain eye contact, the mobile ground unit 80 turns toward the viewer while the rotating upper stage 24, video monitor 40 and video camera 50 simultaneously turn in the opposite direction at the same rate of rotation, i.e. so as to appear to remain stationary. The resulting position is shown in FIG. 6C. Consequently, the remote conferee can maintain "eye contact" with the viewer when turning the mobile ground unit 80 to approach the viewer. The details of this operation will be further described below with reference to FIGS. 9-13.

Next, referring to FIGS. 7a-7c, the vertical lifting and lowering mechanism 70 is shown in operation. FIG. 7a shows the vertical lifting and lowering mechanism 70 fully retracted. FIG. 7b shows the vertical lifting and lowering mechanism 70 in a partially raised position. FIG. 7c shows the vertical lifting and lowering mechanism 70 in a fully extended position. The height of the teleconferencing robot 100 when the vertical lifting and lowering mechanism 70 is fully extended represents approximately the height of a standing person. The vertical lifting and lowering mechanism 70 is adjustable to any height between the fully extended and fully retracted positions, shown in FIG. 7c and FIG. 7a respectively, so that an appropriate height can be established for a given situation. For example, when the teleconferencing robot 100 is positioned next to a conference table, the height might be appropriately adjusted to represent a sitting position. If the remote conferee or local conferee is a tall person, the vertical lifting and lowering mechanism 70 may be extended to reflect the remote conferee's height. Optionally, the remote conferee may want to match the height of the person to whom the remote conferee is speaking.

Now, referring to FIGS. 8a-8d, the operation of the attention-getting mechanism 90 is shown. FIG. 8a shows a representation of a hand and arm 90 in a standby position, laying against the side of video monitor 40. FIG. 8b shows the movement of the hand

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and arm 90 by rotation outwardly from the shoulder coupling point 91 so that it is then at an angle from the side of video monitor 40. FIG. 8c shows a further action of hand and arm 90 where it is rotated through a 90° angle about an axis along the arm thereof such that the hand appears to be in a "palm-open" position in relation to the viewer. FIG. 8d shows the representation of a hand and arm 90 in the palm-open position being rotated alternately outwardly and inwardly to mimic a waving motion. Such a motion may be easily achieved, for example, by using motors and mechanisms similar to that used for automobile windshield wipers.

FIG. 9 is a simplified block diagram showing the interconnection between the remote teleconferencing unit 120, located at the remote conferee's site, and the teleconferencing robot 100, located at the local group meeting site. Audio/video/data communications controllers 128 and 129 receive and transmit a plurality of audio-, video- and data-signals between the remote teleconferencing unit 120 and the teleconferencing robot 100 via a transmission system 130, which can be any suitable transmission system, including known telephone lines, wireless transmission, etc. The plurality of signals shown in FIG. 9 are explained in greater detail below. The teleconferencing robot 100 includes the micro-controller 28 which controls the attention getting mechanism 90 as well as various other teleconferencing robot components represented by block 99. The micro-controller 28 also controls the vertical lifting and lowering mechanism 70 and mobile ground unit 80 when provided, both of these units being optional.

Now referring to FIG. 10, the schematic layout of remote teleconferencing unit 120 is shown. Remote teleconferencing unit 120 ("RTU 120") includes a microphone 121 to pick up the voice of the remote conferee and send a RTU outgoing audio signal ("RTUOAS") to audio/video/data communications controller 128 ("AVDCC 128"). The AVDCC 128 controls the transmission and reception of all of the various RTU signals to and from an equivalent communications controller, AVDCC 129 (shown in FIG. 9), located at the local group meeting site.

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RTU 120 further includes a video camera 122 to capture an image of the remote conferee. The video camera 122 sends an RTU outgoing video signal ("RTUOVS") to AVDCC 128. Amplified speaker 123 receives an RTU incoming audio signal ("RTUIAS") from AVDCC 128. The RTUIAS originates from the teleconferencing robot 100 (shown in FIG. 9) and typically consists of the voices of the local conferees at the group meeting site.

RTU 120 further includes a teleconferencing robot remote control system 119 which remotely controls the operation of the teleconferencing robot 100 of FIG. 9. The teleconferencing robot remote control system 119 comprises a video monitor 124, an operations panel 125, a graphics overlay unit 126 and a main control unit 127. The remote conferee controls the teleconferencing robot 100 of FIG. 9 by means of input at the operations panel 125. Operations panel 125 may be a keyboard, joystick, mouse or any other input device or a combination thereof. The main control unit 127 receives the input from operations panel 127 and sends out an RTU outgoing data signal ("RTUODS") to AVDCC 128 and eventually to micro-controller 28 of FIG. 9.

The RTUODS contains instructions and control signals to control the various functions of the teleconferencing robot 100 of FIG. 9. The main control unit 127 also provides feedback to the remote conferee by means of graphics overlay unit 126 which may display various characters, symbols and icons on video monitor 124. An RTU incoming video signal ("RTUIVS") originating from the teleconferencing robot 100 of FIG. 9 is received by the graphics overlay unit 126 and is passed through to video monitor 124, either with or without any characters, symbols and icons superimposed on the video image created by the RTUIVS on video monitor 124.

The main control unit 127 further receives an RTU incoming data signal ("RTUIDS") which contains a plurality of feedback signals from the teleconferencing robot 100, the vertical lifting and lowering mechanism 70 and the mobile ground unit 80, all shown in

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FIG. 9. Some of the feedback contained in the RTUIDS may be represented graphically to the remote conferee *via* the graphics overlay unit 126 and video monitor 124. For example, a graphic may show the current rotational position of the rotating upper stage 24 of FIGS. 2a-2c so that the remote conferee is aware of any limitations of turning further left or further right.

Now referring to FIG. 11, the teleconferencing robot components 99 of FIG. 9 are shown in greater schematic detail. The micro-controller 28 controls the operation of various components based on control instructions received from the main control unit 127 shown in FIG. 9. These control instructions contained in the RTUODS are transmitted by the AVDCC 128 through the transmission system 130 and to the AVDCC 129, all shown on FIG. 9. The AVDCC 129 of FIG. 9 transmits the same control instructions to the micro-controller 28 as the teleconferencing robot incoming data signal ("TRIDS") as shown on FIG. 11. The micro-controller 28 also provides feedback to the main control unit 127 of FIG. 10 by means of the teleconferencing robot outgoing data signal ("TRODS") which is transmitted to the AVDCC 129 of FIG. 10.

The micro-controller 28 activates the attention-getting mechanism 90 upon receiving an instruction from the remote conferee via the operations panel 125 shown in FIG. 10. Activation causes the attention-getting mechanism to rotate the representation of the hand and arm outwards, twist the hand 90° into a "palm-open" position, then start a waving motion back and forth, as illustrated in FIGS. 8a-8d, above. The required motion may be obtained quite easily, for example, by using mechanisms and motors similar to that used for automobile windshield wipers.

The swiveling feature of the teleconferencing robot 100, as illustrated in FIGS. 2a-2c, can be either automatic or manually controlled by the remote conferee. A switch unit 63 receives a speaker location control signal ("SLCS") to control the zoom function of video camera 50 and control the pan/tilt video camera base 52. The switch unit 63 also

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receives a teleconferencing robot control signal ("TRCS") from the micro-controller 28. The remote conferee can cause the switch unit 63 to switch between automatic mode, where the SLCS is used, and manual mode, where the remote conferee provides the pan, tilt and zoom signals.

5 In automatic mode, the speaker location control unit 61 receives input signals from a microphone array 62 comprising three microphones 62a, 62b and 62c, as shown in FIG. 1. Using the signals from the microphone array 62, the speaker location control unit 61 determines from which direction the sound is coming from. The speaker location
10 control unit 61 then produces the SLCS to control the zoom function of video camera 50 and control the pan/tilt video camera base 52.

For manual mode, the remote conferee first sends a switch signal to switch unit 63 to enter the manual mode. Then, the remote conferee provides pan, tilt and zoom control signals via the operations
15 panel 125, shown in FIG. 10. The remote conferee can switch back to automatic mode by sending another switch signal to switch unit 63.

In either automatic or manual mode, the switch unit 63 sends on a pan/tilt/zoom control signal ("PTZCS") to the camera pan/tilt/zoom control unit 64. The camera pan/tilt/zoom control unit
20 64 controls pan drive unit 53, tilt drive unit 54 and zoom drive unit 55 to drive the pan/tilt video camera base 52 and the zoom on video camera 50. The camera pan/tilt/zoom control unit 64 also provides a teleconferencing robot feedback signal 1 ("TRFS1") to the micro-controller 28 to communicate to the main control unit 127 of FIG. 10 the
25 camera pan/tilt/zoom control information.

The pan control signal ("PCS") from the camera pan/tilt/zoom control unit 64 to the pan drive unit 53 is split and is also provided as an input to switch unit 57. An optional position sensor 56 is positioned to read the position and rotation of the pan base of pan/tilt
30 video camera base 52. The position sensor 56 provides a position sensor feedback signal ("PSFS") which is compatible with the PCS signal and which provides essentially the same pan position and rotation

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information. The position sensor 56 may be any number of devices which senses the panning movement of the pan/tilt video camera base 52. Two such devices are shown in FIGS. 11a and 11b, operationally coupled to the pan/tilt video camera bases 52a and 52b, respectively.

5 FIG. 11a shows a perspective view of one embodiment of a position sensor 56a with a shaft head 150 mechanically engaged to the pan/tilt video camera base 52a by a wire 151 set at an appropriate tension to cause the shaft head 150 to rotate as the pan/tilt video camera base 52a pans left and right. A base 152 of the position sensor 56a generates a
10 signal corresponding to the rotation of the shaft head 150 and the signal is transmitted via a communication link 153 to the switch unit 57 of FIG. 10.

 FIG. 11b shows a side view of another embodiment of a position sensor 56b with a shaft head 160 frictionally engaged to a
15 spherical, dome shaped top of a pan/tilt video camera base 52b. The rotation of the pan/tilt video camera base 52b causes the shaft head 160 to rotate. A base 162 of the position sensor 56b generates a signal corresponding to the rotation of the shaft head 160 and the signal is transmitted via a communication link 163 to switch unit 57 of FIG. 11.

20 In addition to the above two mechanisms, numerous other mechanical and non-mechanical means of sensing the rotation of the pan/tilt video camera base 52 are available.

 The switch unit 57 can be manually set to pass on either the PCS signal or the PSFS signal from the optical position sensor 56. The
25 switch unit 57 passes on the selected signal as a rotating upper stage control signal ("RUSCS") to the rotating upper stage drive unit 23. The rotating upper stage drive unit receives the RUSCS and drives the rotating upper stage 24 left or right. Since the RUSCS is either the PCS or the PSFS, both of which provide information on the video camera 50 pan
30 position, the rotating upper stage 24 is essentially driven to the same pan position as the video camera 50. The rotating upper stage drive unit 23 provides a teleconferencing robot feedback signal 2 ("TRFS2") to the

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micro-controller 28 so that the remote conferee is aware of the position of the rotating upper stage 24.

Still referring to FIG. 11, the video monitor 40 displays a substantially life-sized image of the remote conferee's face on the screen.

5 This image is received as the teleconferencing robot incoming video signal ("TRIVS") from the AVDCC 129, shown in FIG. 9. The TRIVS corresponds to the RTUOVS shown in FIG. 10. Video monitor 40 is placed on or fastened to the rotating upper stage 24, as shown in FIG. 1. Thus, the video monitor 40 is rotating with the rotating upper stage 24 and is essentially synchronized to the pan position and rotation of the video camera 50.

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The video camera 50 provides an image of the local conferee, typically the local conferee that is speaking, and sends a teleconferencing robot outgoing video signal ("TROVS") to the AVDCC 129 of FIG. 9. The TROVS corresponds to the RTUIVS of FIG. 10.

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Microphone 42 picks up the sound from the local conferees and sends a teleconferencing robot outgoing audio signal ("TROAS") to the AVDCC 129. Optionally, if the automatic speaker location system is being used, the sound picked up by the microphone array 62 may be supplied as the TROAS (this optional configuration is not shown in FIG. 11). The TROAS corresponds to the RTULAS of FIG. 10.

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The amplified speaker 26 receives a teleconferencing robot incoming video signal ("TRIAS") from the AVDCC 129, shown in FIG. 9. The TRIAS corresponds to the RTUOAS of FIG. 10 and provides the local conferees with sound from the remote conferee.

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Now referring to FIG. 12, a schematic of the vertical lifting and lowering mechanism 70 ("VLLM 70") is shown. The VLLM 70 comprises piston assemblies 71a, 71b and 71c which are positioned in an arrangement as shown in FIG. 5. Piston assembly drive units 74a, 74b and 74c drive the piston assemblies 71a, 71b and 71c respectively. The piston assembly drive units 74a, 74b and 74c are controlled by the vertical lifting and lowering control unit 73 ("VLLCU 73"). The VLLCU 73

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receives a vertical lifting and lowering control signal ("VLLCS") from the micro-controller 28 of FIG. 9. The VLLCU 73 also provides a vertical lifting and lowering feedback signal ("VLLFS") to the micro-controller 28 of FIG. 9 so that the remote conferee receives feedback as to the state of
5 the VLLM 70.

In order to raise the teleconferencing unit 100, as illustrated in FIGS. 7a-7c, the piston assemblies 71a, 71b and 71c are extended in concert at the same rate, starting from a fully retracted position as shown in FIG. 7a. In FIG. 7c, the piston assemblies 71a, 71b and 71c (hidden inside
10 the flexible accordion sleeve 72) are fully extended. To lower the teleconferencing unit 100, the piston assemblies 71a, 71b and 71c are retracted at the same rate. By controlling the amount of extension of piston assemblies 71a, 71b and 71c, the teleconferencing robot 100 can be set at a height anywhere between a fully retracted and fully extended
15 position.

Referring back to FIG. 5, in order to mimic bowing, the center piston assembly 71b can be extended less than the outer piston assemblies 71a and 71c. This will cause the teleconferencing robot 100 to tilt forward and assume a bowing position. Extension of the center
20 piston assembly 71c back to the same extension of the outer piston assemblies 71a and 71c will cause the teleconferencing robot to return to an up-right position.

Now referring to FIG. 13, a schematic diagram of the mobile ground unit 80 ("MGU 80") is shown. A power source 87 provides
25 power to MGU control 88 and the wheel drive motors 81a and 81b. The MGU control 88 receives an MGU control signal ("MGUCS") from the micro-controller 28, as shown in FIG. 9. The MGU control 88 provides a MGU feedback signal ("MGUFS") back to the micro-controller 28 to provide feedback about the MGU to the remote conferee.

30 The MGUCS contains control information to operate the rotation speed and direction of rotation of the drive wheels 82 and 83. In order to move forward, the left wheel drive motor 81a and the right

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wheel drive motor 81b turn the drive wheels 82 and 83 in a forward direction at the same rate. Reversing the direction causes the MGU 80 to move backwards, but this will typically not be used since the remote conferee requires visual feedback from the video camera 50, as shown in
5 FIGS. 6a-6c, in order to operate the MGU 80.

To turn right, the right wheel drive motor 81b will hold the right drive wheel 83 stationary while the left wheel drive motor 81a drives the left drive wheel in a forward direction. To make a wider right turn, in known manner, the right wheel drive motor 81b can drive the
10 right drive wheel 83 at a slower rate than the left wheel drive motor 81a is driving the left drive wheel 82. To turn right while staying in position, the right wheel drive motor 81b can drive the right drive wheel 83 in a reverse direction at the same rate as the left wheel drive motor 81a drives the left drive wheel 82 in a forward direction. Left turns can be made in
15 an analogous fashion with the wheels and directions reversed.

In order to perform the manoeuvre shown in FIGS. 6a-6c, the teleconferencing robot 100 is operated as described above so that the video monitor 40 is directed towards the viewer. To turn the MGU 80 towards the viewer, in preparation for moving towards the viewer, the
20 MGU 80 is operated to turn left while staying in position. In order to achieve this, referring back to FIG. 11, the rotating upper stage drive unit 23 provides a feedback signal, TRFS2, to the micro-controller 28. Using the TRFS2, the micro-controller 28 then calculates the amount of rotation required by the MGU 80 to rotate into position. The micro-
25 controller 28 then sends appropriate control signals TRCS and MGUCS (shown in FIG. 9) so that the MGU 80 is rotating in position towards the viewer and the rotating upper stage 24 and the video camera 50 are rotating at the same rate of rotation but in the opposite direction.

It will be appreciated that, while the preferred embodiment
30 of the invention has been described, there are numerous variations possible within the scope of the present invention. For example, rather than having a swivel base, a ceiling mounted swivel mechanism may be

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used to support a hanging video monitor. In such a case, the video camera and speaker location unit may be fastened to a platform hanging beneath the video monitor. Furthermore, a vertical lifting and lowering mechanism may be mounted from the ceiling to raise and lower a video
5 monitor from the ceiling. In addition, many different designs and configurations possible. For example, in FIGS. 14a-14c, the rotating upper stage 24 and lower stage 22 of FIG. 1 are replaced by rotating upper stage 24a and lower stage 22a.

FIG. 14a-14c are schematic diagrams of a video monitor system in accordance with the present invention. FIG. 14a is a side view of the system showing a video monitor 10, a camera 12, and a speaker 14. FIG. 14b is a top view of the system showing the video monitor 10, camera 12, and speaker 14. FIG. 14c is a front view of the system showing the video monitor 10, camera 12, and speaker 14.

I CLAIM:

1. A teleconferencing robot, for enabling a remote conferee to project a sense of presence into a group meeting, the teleconferencing
5 robot comprising:

a base;

a video monitor movably mounted to the base for receiving
and displaying an image of the remote conferee;

a video camera movably mounted on the base:

- 10 control means mounted on the base for moving the video monitor and video camera in response to an input control signal; and

wherein said video monitor and video camera move in response to said input control signal to enable a remote conferee to project a sense of presence into the group meeting.

15

2. A teleconferencing robot as claimed in claim 1, wherein the video monitor is rotatably mounted to the base unit, for rotation about a substantially vertical axis; and

wherein the control means includes a rotating drive unit for
20 rotation of the video monitor.

3. A teleconferencing robot as claimed in claim 2, wherein the video camera is rotatably mounted with the video monitor to the base unit; and

25 wherein the rotating drive unit rotates the video monitor and video camera.

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4. A teleconferencing robot as claimed in claim 2, wherein the video camera is rotatably mounted to the base, for rotation about a substantially vertical axis; and

wherein the control means includes a pan drive unit for
5 rotation of the video camera.

5. A teleconferencing robot as claimed in claim 4, wherein the video camera is additionally mounted so as to be tiltable upwards and downwards; and

10 wherein the control means includes a tilt drive unit for tilting the video camera upwards and downwards.

6. A teleconferencing robot as claimed in claim 1, wherein said input control signal is derived from sound source detection means such that
15 said control signal represents the direction of said sound source with respect to said monitor and said control means being adapted to drive said video monitor, in response to said control signal, to a position substantially facing said detected direction.

20 7. A teleconferencing robot as claimed in claim 6, wherein the base comprises upper and lower stages, wherein the video monitor is secured to the upper stage, and the lower and upper stages are rotatable relative to one another about a substantially vertical axis; and

wherein the upper stage has a defined forward direction with
25 the video monitor normally being directed in said defined forward direction.

8. A teleconferencing robot as claimed in claim 3, wherein the base comprises an upper part on which the video monitor is mounted and a lower part, and means for vertically displacing the upper and lower parts relative to one another.

5

9. A teleconferencing robot as claimed in claim 3, wherein the base comprises an upper part on which the video monitor is mounted and a lower part; and

wherein the lower part of the base comprises a mobile ground unit including wheels and drive motors for rotating the wheels, to drive the teleconferencing robot across the ground.

10. A teleconferencing robot as claimed in claim 3, wherein the screen of the video monitor is positioned at or near the vertical axis about which the video monitor rotates such that the angle formed by two straight lines lying in a horizontal plane crossing at the vertical axis and further extending through left and right hand edges of the screen of the video monitor is substantially 160° - 200° .

20 11. A teleconferencing robot as claimed in claim 3, further comprising an attention getting means for getting the attention of other conferees; and

wherein the control means includes means for actuating the attention getting means.

25

12. A teleconferencing robot as claimed in claim 11, wherein the attention getting means comprises a representation of a hand and arm; and

wherein a free end of the arm is mechanically coupled to the base, whereby said representation of a hand and arm may be rotated alternatively inwardly and outwardly, to mimic a waving motion.

- 5 13. A teleconferencing robot as claimed in claim 3, in combination with a remote teleconferencing unit which comprises a second microphone and a second video camera for obtaining an audio signal and an image from the remote conferee for transmission to the video monitor of the teleconferencing robot, and a second video monitor and a second
10 speaker for providing an image and an audio signal received from the teleconferencing robot;

wherein the video monitor of the teleconferencing robot is provided with a speaker for outputting an audio signal received from the microphone of the remote teleconferencing unit; and

- 15 wherein the input control signal is provided by the remote teleconferencing unit.

14. A teleconferencing robot in combination with a remote teleconferencing unit as claimed in claim 13, wherein the remote
20 teleconferencing unit and the teleconferencing robot are each provided with a respective communications controller for audio, video and data signals, for communication therebetween over a transmission system; and

wherein the communications controllers transmit audio and video signals in both directions between the remote teleconferencing unit and the teleconferencing robot, and data signals to the teleconferencing
25 robot, for controlling the teleconferencing robot and data signals back to the remote teleconferencing unit, to provide information on movement of the teleconferencing robot.

15. A teleconferencing robot as claimed in claim 5, further comprising microphone array means for enabling a location of a speaker to be determined and generating a detection signal indicative of the location
5 of the speaker wherein the input control signal is derived from the detection signal and causes the rotating drive unit to rotate the video monitor to a position substantially facing the location of the speaker.

16. A teleconferencing robot as claimed in claim 15, further
10 comprising a switch unit enabling the input control signal to be selectively derived from the detection signal and a remote signal generated by the remote conferee.

17. A teleconferencing robot as claimed in claim 15, wherein the
15 base comprises a supporting arm extending around and behind the video monitor and supporting the video camera and the audio array means above the video monitor; and

wherein the microphone array means is fixed to the base such that the video camera and the video monitor rotate independently of the
20 microphone array means.

18. A teleconferencing robot as claimed in claim 17, wherein a screen of the video monitor is positioned near the vertical axis about which the video monitor rotates; and

25 wherein the video camera rotates substantially about the vertical axis.

19. A teleconferencing robot as claimed in claim 5, further comprising:

location determining means for enabling a location of a person to be determined and generating a detection signal indicative of the
5 location of the speaker;

wherein the location determining means is fixed to the base such that the video camera and the video monitor rotate independently of the location determining means; and

wherein the input control signal is derived from the detection
10 signal and causes the rotating drive unit and pan drive unit to rotate the video monitor and video camera, respectively, to a position substantially facing the location of the speaker.

20. The teleconferencing robot as claimed in claim 2, wherein the
15 input control signal is derived from a remote signal generated by the remote conferee.

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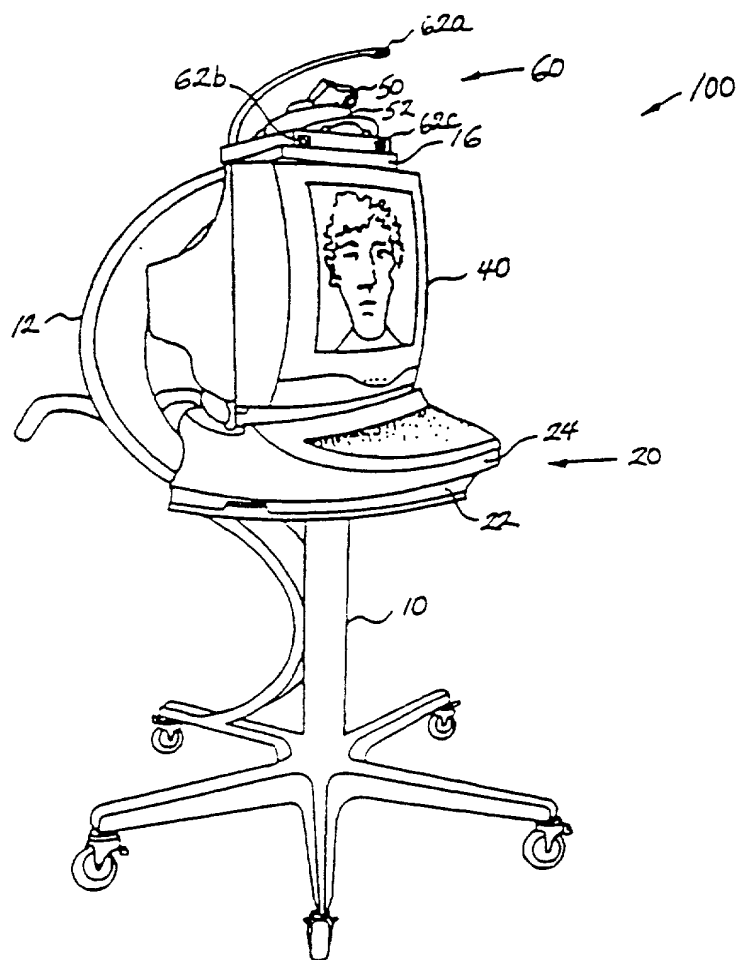


FIG. 1

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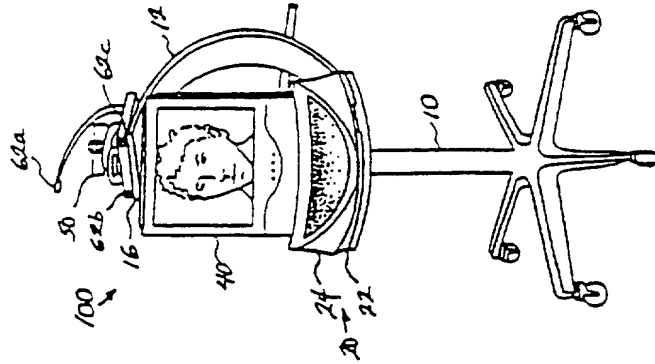


FIG. 2c

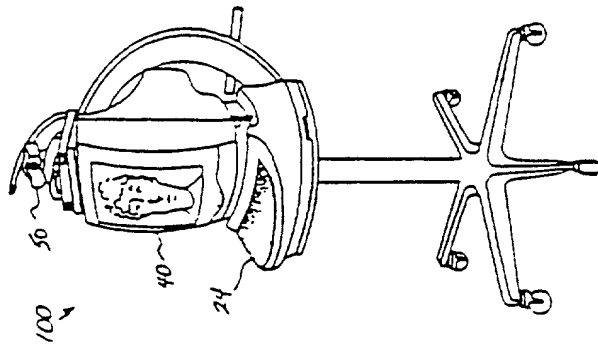


FIG. 2b

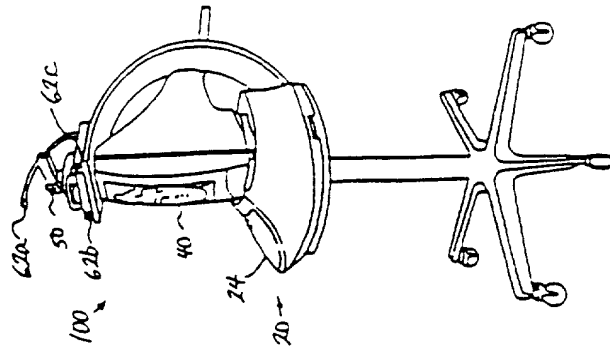


FIG. 2a

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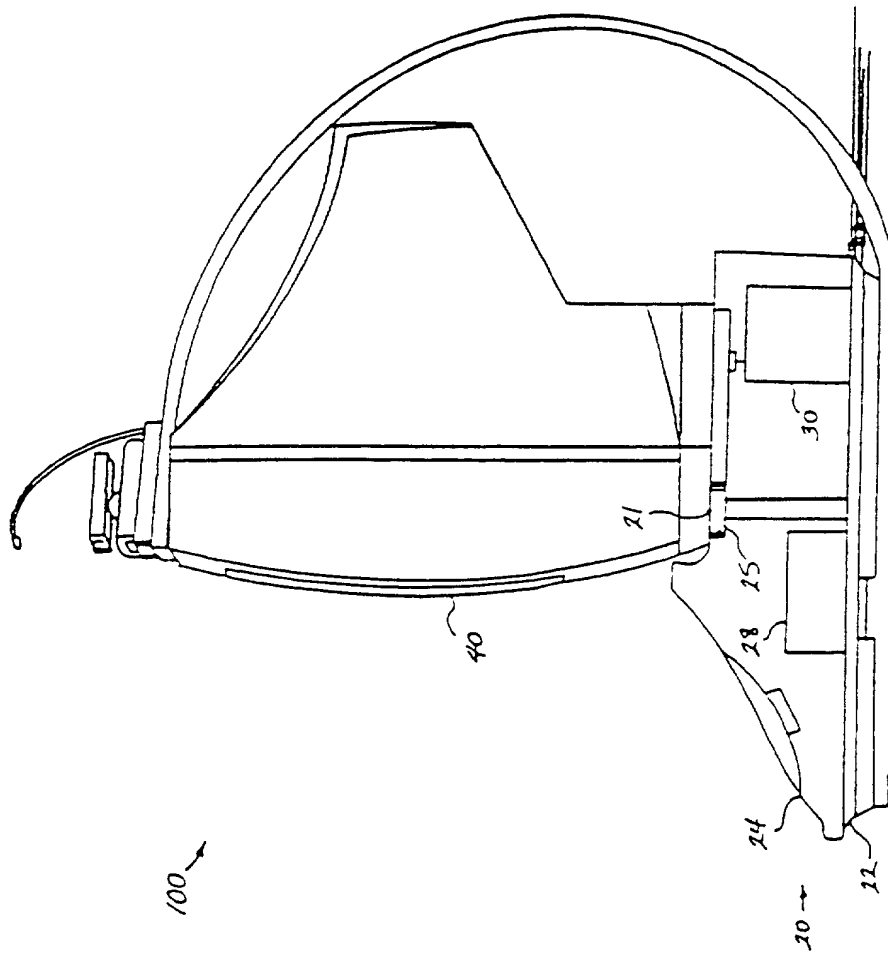


FIG. 3

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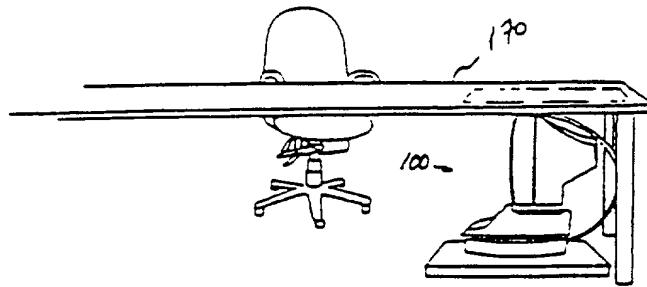


FIG. 4a

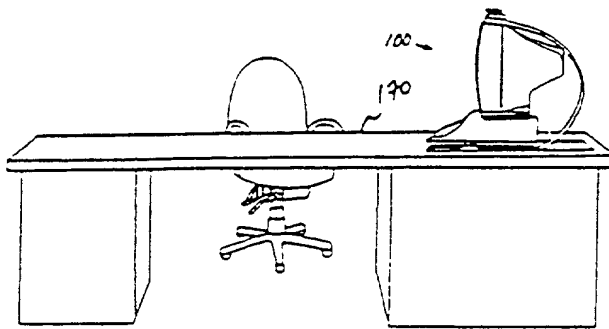


FIG. 4b

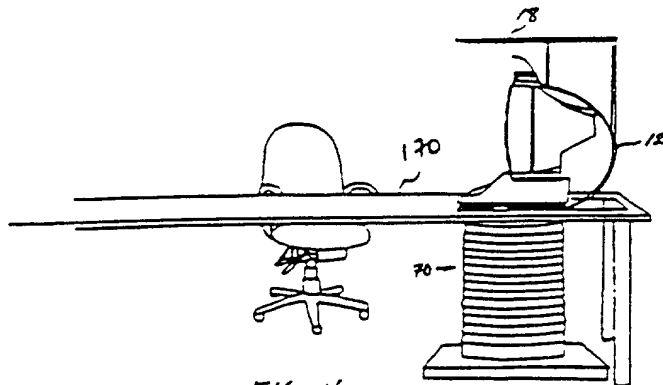


FIG. 4c

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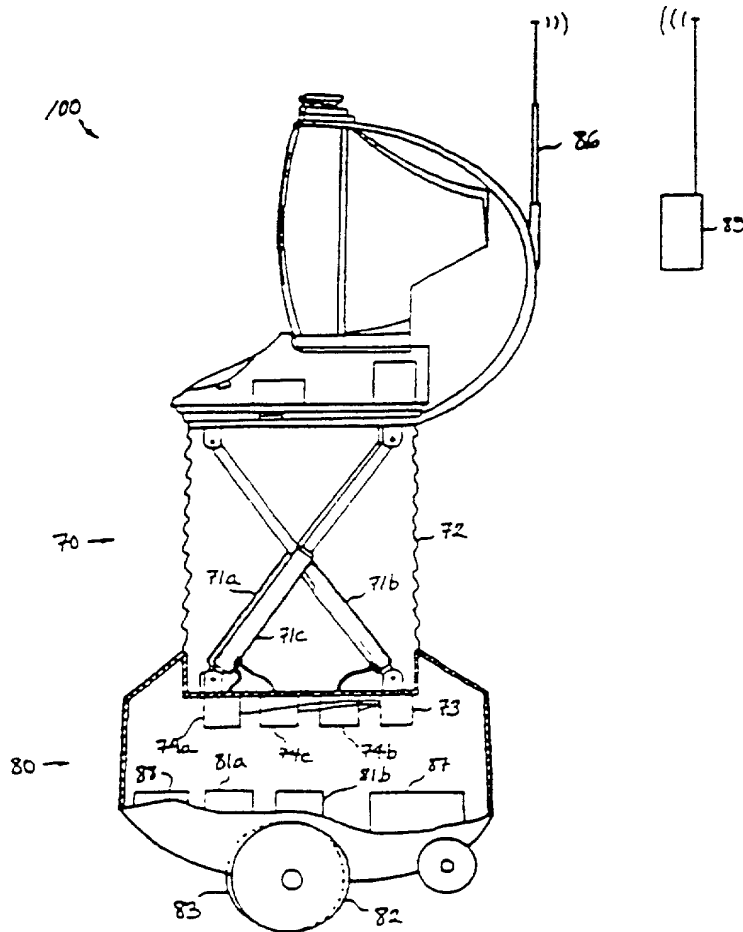
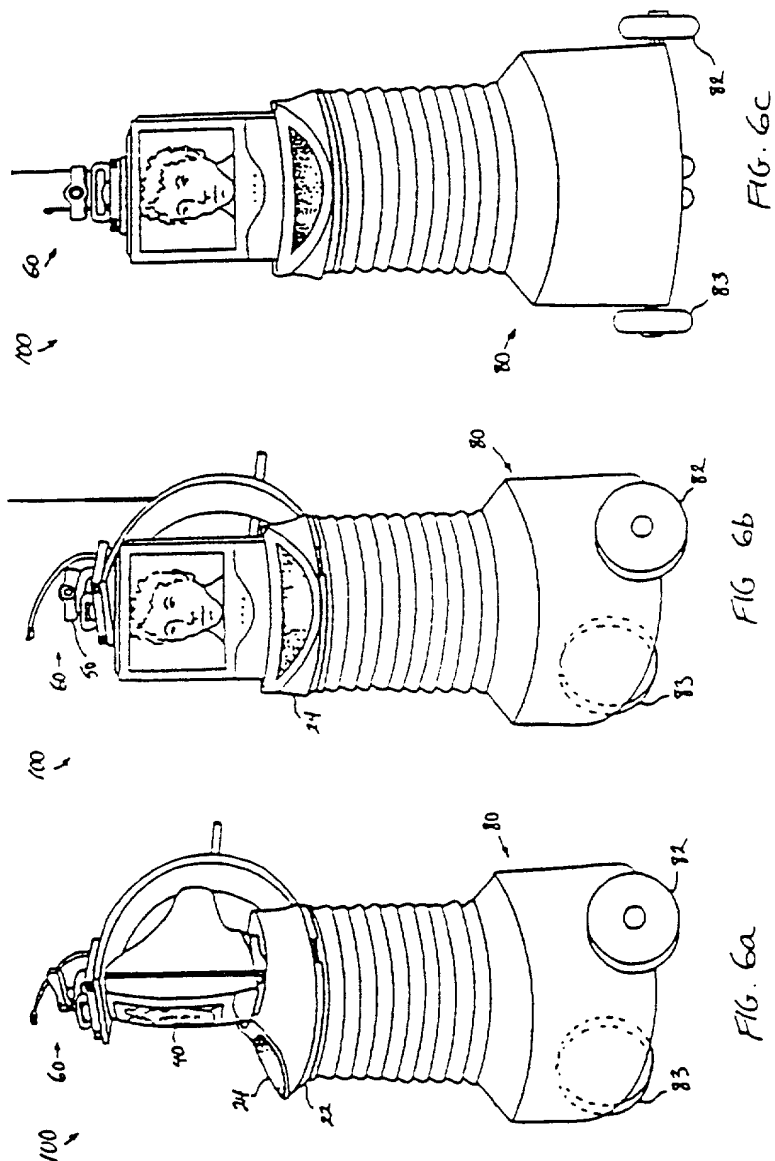


FIG. 5

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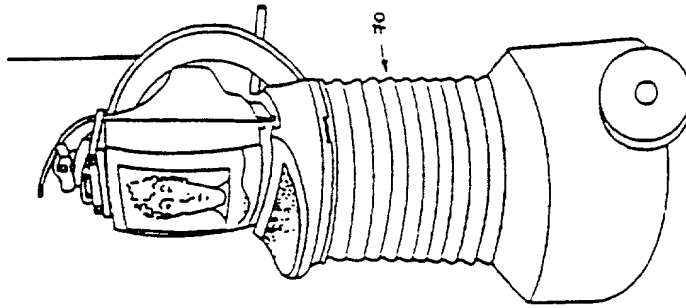


FIG. 7c

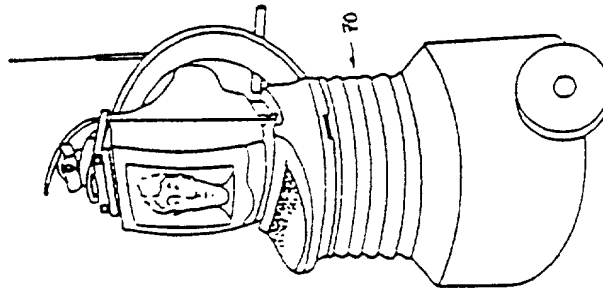


FIG. 7b

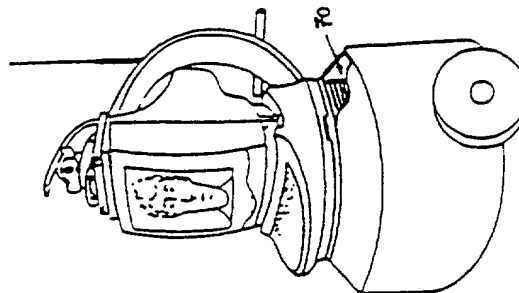
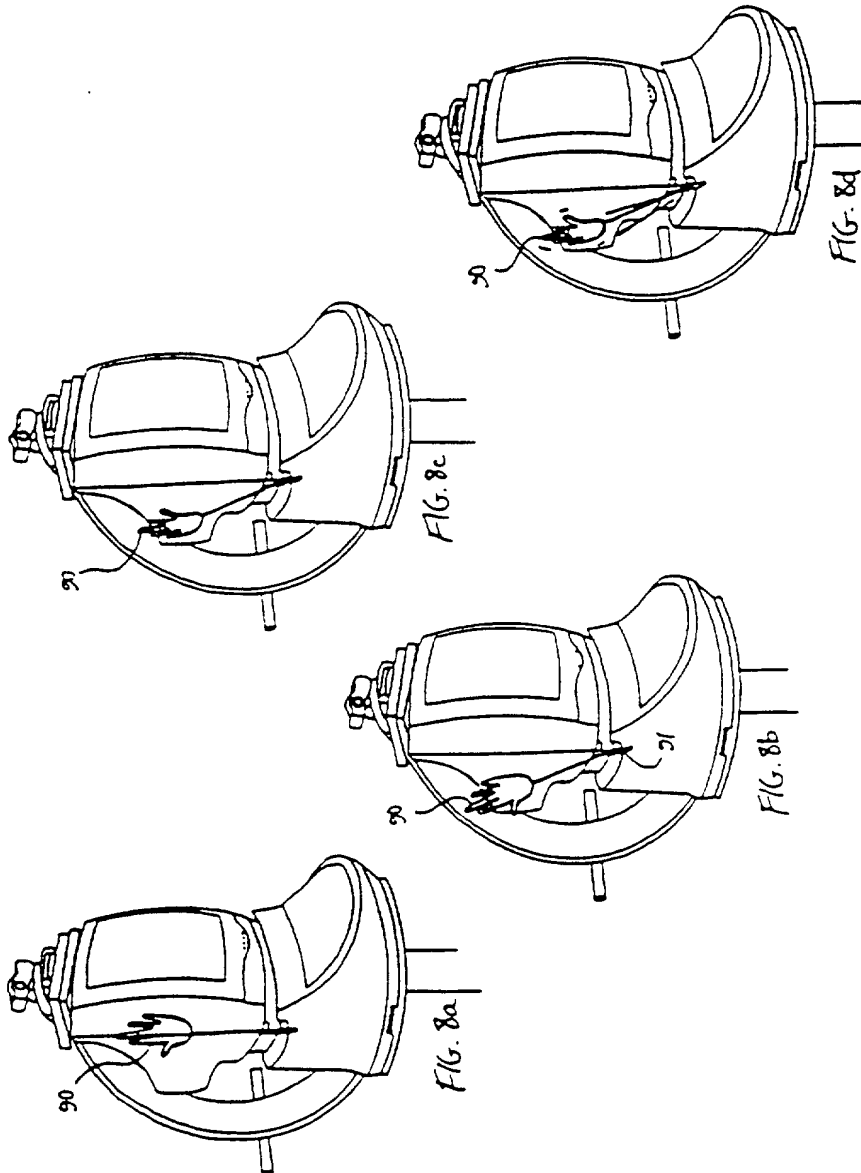


FIG. 7a

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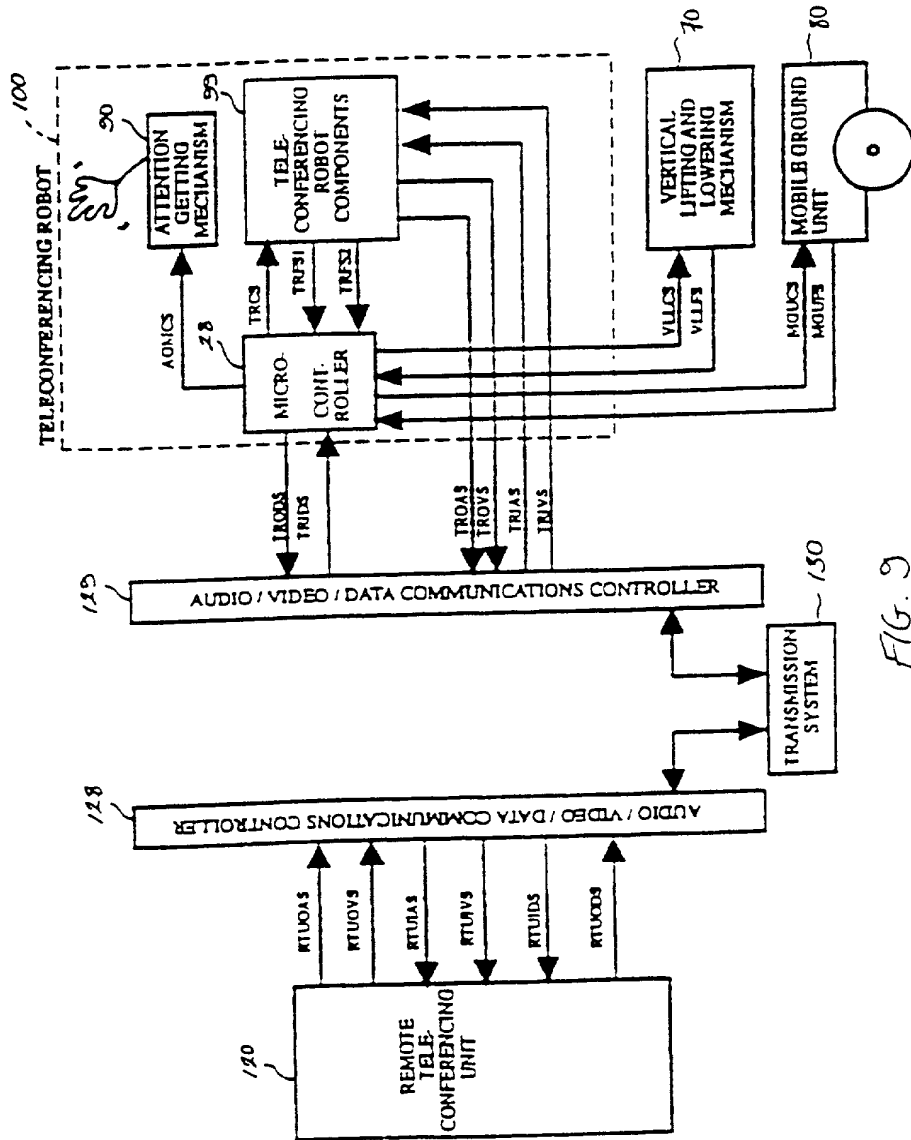


FIG. 9

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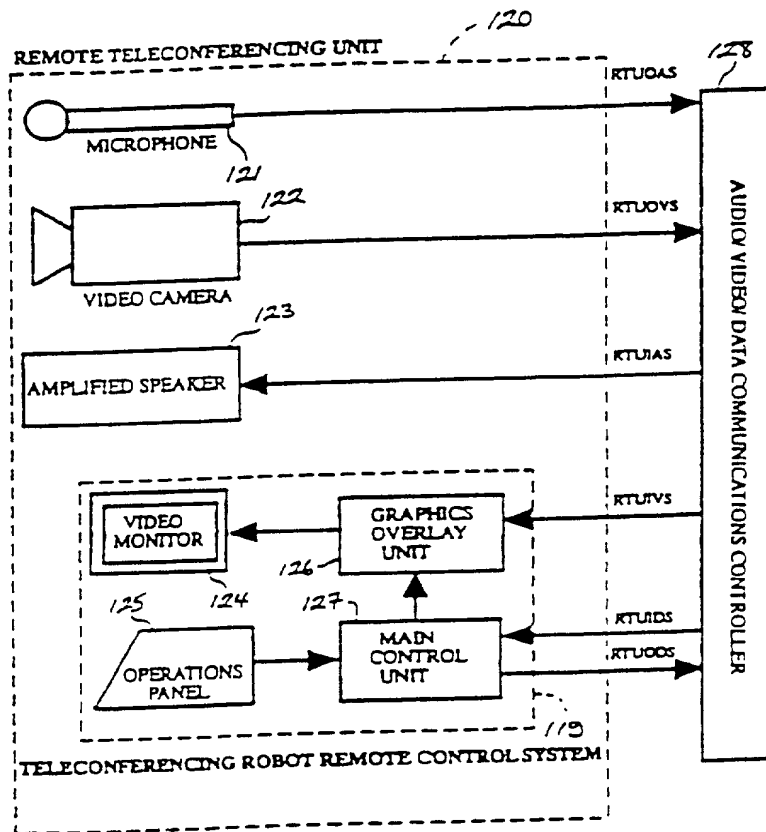
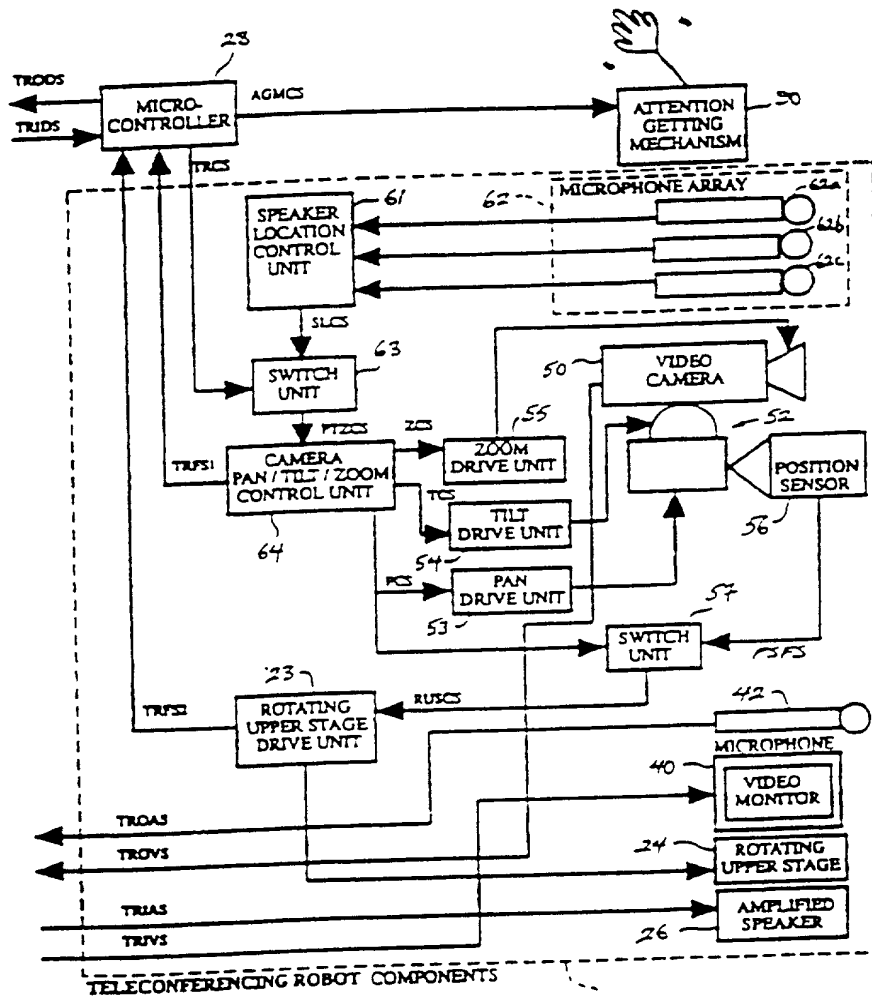


FIG. 10

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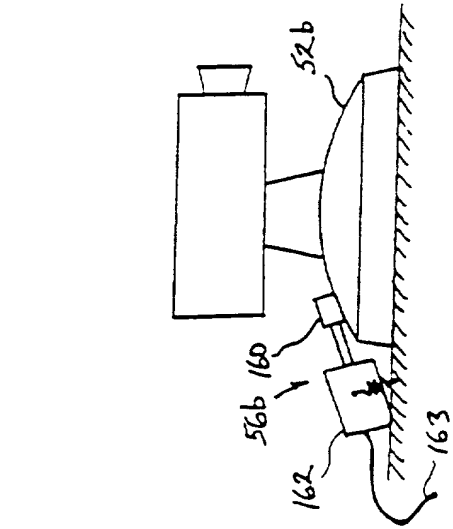


FIG 11a

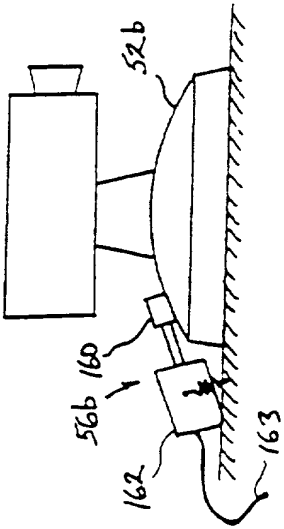
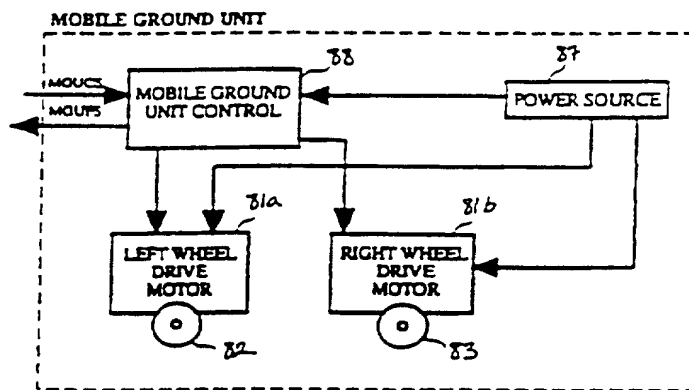
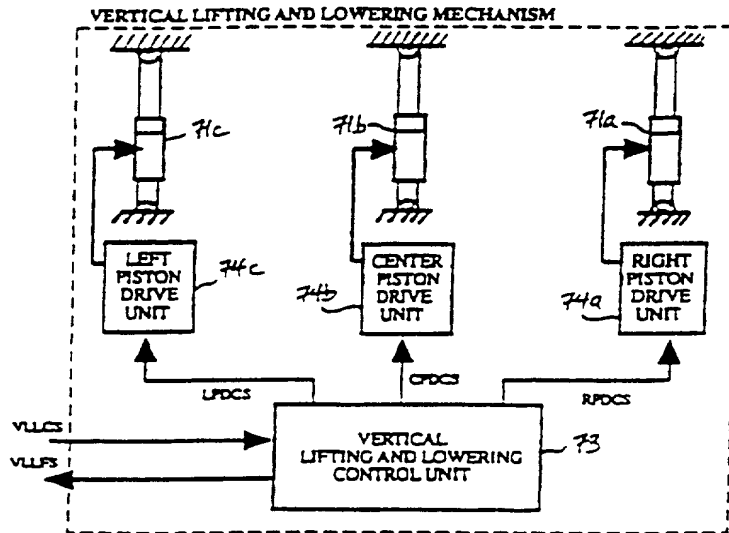


FIG 11b

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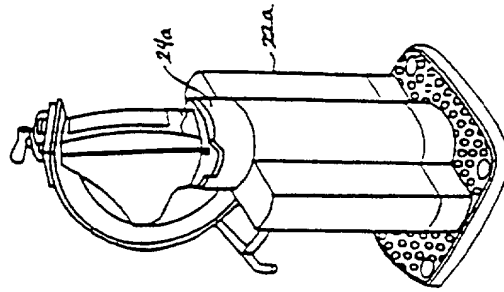


FIG. 14c

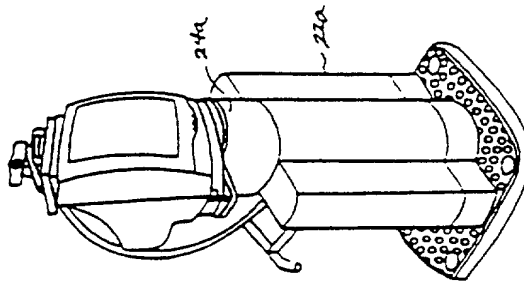


FIG. 14b

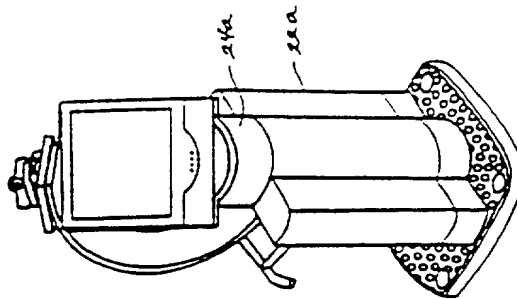


FIG. 14a

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63) <input type="checkbox"/> Declaration Submitted with Initial Filing OR <input checked="" type="checkbox"/> Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)	Attorney Docket Number	P150299
	First Named Inventor	SMITH, Graham Thomas
	COMPLETE IF KNOWN	
	Application Number	09/ 423,414
	Filing Date	November 8, 1999
	Group Art Unit	
	Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TELECONFERENCING ROBOT WITH SWIVELING VIDEO MONITOR

the specification of which *(Title of the Invention)*

☐ is attached hereto
OR
☒ was filed on (MM/DD/YYYY) **05/06/1998** as United States Application Number or PCT International

Application Number **PCT/CA98/00463** and was amended on (MM/DD/YYYY) **05/14/1999** (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)
60/045,793	05/07/1997

☐ Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

[Page 1 of 2]

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I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

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As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

☒ Customer Number **022839**

OR

☐ Registered practitioner(s) name/registration number listed below



Name	Registration Number	Name	Registration Number
Paul L. Herbert	27,278	Gary M. Travis	43,551
L. Brant Latham	30,013	Jeff Pervanas	41,543
P. Daniel Hitchcock	32,109		

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☒ Customer Number **022839** OR ☐ Correspondence address below

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor:		<input type="checkbox"/> A petition has been filed for this unsigned inventor					
Given Name (first and middle (if any))		Family Name or Surname					
GRAHAM THOMAS		SMITH					
Inventor's Signature				Date	25/1/99		
Residence: City	TORONTO	State	ON	Country	CANADA	Citizenship	CA
Post Office Address	61 EUCLID AVENUE						
Post Office Address	APARTMENT 2						
City	TORONTO	State	ON	ZIP	M6J 2J8	Country	CANADA

☒ Additional inventors are being named on the **1** supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto

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DECLARATION

ADDITIONAL INVENTOR(S) Supplemental Sheet Page 1 of 1

Name of Additional Joint Inventor, if any:				<input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle [if any])				Family Name or Surname			
DEBORAH INGRID				FELS			
Inventor's Signature	<i>X Deborah Fels</i>			Date	25-11-99		
Residence: City	TORONTO	State	ON	Country	CANADA	Citizenship	CA
Post Office Address	164 5F 277 ARLINGTON AVENUE						
Post Office Address							
City	TORONTO	State	ON	ZIP	M6C 2Z6	Country	CANADA
Name of Additional Joint Inventor, if any:				<input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle [if any])				Family Name or Surname			
JUTTA				TREVIRANUS			
Inventor's Signature	<i>X Jutta</i>			Date	25-11-99		
Residence: City	TORONTO	State	ON	Country	CANADA	Citizenship	CA
Post Office Address	323 WOODBINE AVENUE						
Post Office Address							
City	TORONTO	State	ON	ZIP	M4L 3P3	Country	CANADA
Name of Additional Joint Inventor, if any:				<input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle [if any])				Family Name or Surname			
Inventor's Signature				Date			
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